



(19)

Europäisches Patentamt

## European Patent Office

## Office européen des brevets



(11)

EP 1 053 968 A2

(12)

## EUROPEAN PATENT APPLICATION

(43) Date of publication:  
22.11.2000 Bulletin 2000/47

(51) Int. Cl.<sup>7</sup>: B66B 9/08

(21) Application number: 00100177.5

(22) Date of filing: 12.01.2000

(84) Designated Contracting States:  
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU  
MC NL PT SE  
Designated Extension States:  
AL LT LV MK RO SI

(30) Priority: 20.05.1999 IT MI991114

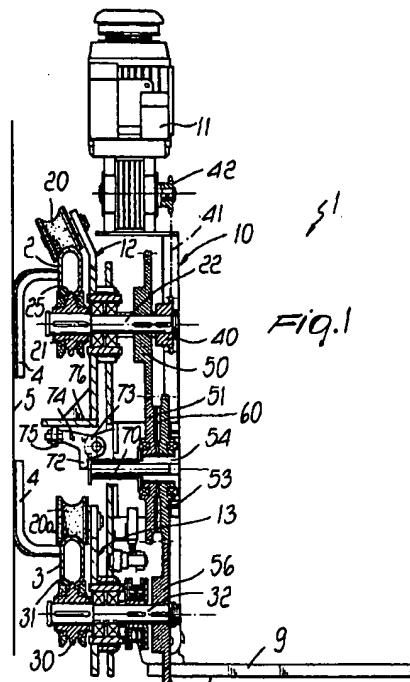
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**(54) Stairlift for variable-slope flight portions**

(57) A stairlift for variable-slope flight portions which comprises an upper guiding bar (2) and a lower guiding bar (3) which can be fixed to a fixed structure (5) and have a constant distance in a vertical direction. A movable frame (10) is slideable on the guiding bars (2,3) and supports an actuation motor (11). A main driving pinion (21) is actuated by the motor (11) and meshes with an upper toothed guide (25) formed on the upper guiding bar (2), and a stabilizer pinion (30) meshes with a lower toothed guide (31) which is formed on the lower guiding bar (3). The stabilizer pinion (30) is freely rotatable if the inclination of the guiding bars (2,3) exceeds a preset value, whereas the stabilizer pinion (30) is connected to the main driving pinion (21) if the inclination of the guiding bars (2,3) is lower than the preset value.



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**Description**

[0001] The present invention relates to a stairlift for variable-slope flight portions.

[0002] It is known that stairlifts, used for example to carry wheelchairs for the handicapped or chairs for the elderly, are usually constituted by a movable frame which is slideable on two guiding bars which are connected to a fixed structure to the side of the staircase.

[0003] Obviously, the frame must maintain a fixed and stable position with respect to the horizontal and therefore it must be able to compensate for the variations in slope which occur for example where there is a landing or otherwise a change in the angle of inclination.

[0004] Solutions are currently already known and are disclosed for example in patent application WO95/15909; they substantially provide for an upper guiding bar and a lower guiding bar which are connected to the wall and are arranged so that their mutual distance is constant in a vertical direction. The frame is slideable on the guides and is actuated by a lower pinion and an upper pinion which are always mutually connected and engage corresponding racks formed on the guides.

[0005] This solution allows to give optimum stability to the assembly, but it suffers the drawback that it requires extreme precision upon manufacture in order to prevent the two lower and upper pinions from losing their pitch, since forcing stresses would otherwise occur which could lead to the jamming of the movement of the frame.

[0006] This precision in manufacture as well as installation is particularly critical especially when there are changes in slope, since from a mechanical point of view it is extremely difficult to maintain a constant pitch which provides assurance against the occurrence of forcing caused by loss of pitch which, in addition to compromising the stability of the assembly, can halt all operation.

[0007] The aim of the invention is to solve the above problem by providing a stairlift for variable-slope flight portions which allows to compensate for any pitch variations without thereby causing forcing or loss of stability of the assembly.

[0008] Within the scope of this aim, a particular object of the invention is to provide a stairlift in which mutual slipping between the pinion that meshes with the upper guide and the pinion that meshes with the lower guide can occur.

[0009] Another object of the present invention is to provide a stairlift which, thanks to its particular constructive characteristics, is capable of giving the greatest assurances of reliability and safety in use.

[0010] Another object of the present invention is to provide a stairlift which can be easily obtained starting from commonly commercially available elements and materials and is also competitive from a merely economical point of view.

[0011] This aim, these objects and others which will become apparent hereinafter are achieved by a stairlift for variable-slope flight portions, according to the invention, which comprises an upper guiding bar and a lower guiding bar which can be fixed to a fixed structure and have a constant distance in a vertical direction, a movable frame being slideable on said guiding bars, said frame supporting an actuation motor, a main driving pinion which is actuated by said motor and meshes with an upper toothed guide formed on said upper guiding bar and a stabilizer pinion which meshes with a lower toothed guide which is formed on said lower guiding bar, characterized in that said stabilizer pinion is freely rotatable if the inclination of said guiding bars exceeds a preset value, means for functional connection between said stabilizer pinion and said main driving pinion being also provided which are actuated if the inclination of said guiding bars is lower than said preset value.

[0012] Further characteristics and advantages of the present invention will become apparent from the description of a preferred but not exclusive embodiment of a stairlift for variable-slope flight portions, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a schematic sectional view, taken along a vertical plane, of the stairlift according to the present invention; and

Figure 2 is a front view of the stairlift.

[0013] With reference to the above Figures, the stairlift for variable-slope flight portions according to the invention, generally designated by the reference numeral 1, comprises an upper guiding bar 2 and a lower guiding bar 3 which can be fixed by means of wall anchors 4 or similar elements to a fixed structure which is constituted for example by a side wall 5 of the flight of stairs.

[0014] The guiding bars 2 and 3 run so as to have a constant distance in a vertical direction.

[0015] A movable frame, generally designated by the reference numeral 10, is slideable on the guiding bars, supports an actuation motor 11 and is provided, for example, with a platform 9 in a downward region.

[0016] An upper carriage 12 and a lower carriage 13 respectively engage the guiding bars and oscillate with respect to the frame 10 so as to ensure that the assembly maintains a constant trim.

[0017] The upper carriage 12 is provided with two upper rollers 20 which engage the upper part of the bar 2 and have, in a downward region, a main driving pinion 21. Pinion 21 is keyed on an actuation shaft 22 which also constitutes the pivot for the oscillation of the carriage 12, which is provided with a lower roller 23 which is laterally adjacent to the main driving pinion 21, which meshes with a rack 25, constituted for example by holes provided in the guiding bar 2.

[0018] Likewise, the lower carriage 13 also is pro-

vided with two upper rollers, designated by the reference numeral 20a, and with a stabilizer pinion 30 which engages a rack 31 which is constituted, in this case also, by holes formed with a uniform pitch in the lower guiding bar 3.

[0019] The stabilizer pinion 30 is keyed on an auxiliary shaft 32 which acts as oscillation pivot for the carriage 13, which is provided with a lower roller 23a.

[0020] The particularity of the invention consists in that the stabilizer pinion 30 is freely rotatable in case of portions of the guiding bars whose inclination exceeds a preset value and is instead rigidly rotationally coupled, and accordingly acts as a stabilizer, in case of portions of the guiding bars whose inclination is lower than said preset value.

[0021] In practical execution, the main shaft 22 is turned by means of a pinion 40 which is keyed on it and is actuated, by means of a chain 41, by a driving pinion 42 which is connected to the motor 11.

[0022] A first gear 50 is keyed to the shaft 22 and meshes with a second gear 51 which is coaxial and faces a third gear 53 rotatably connected to an intermediate shaft 54 on which the gear 51 is rotatably connected.

[0023] Friction means 60 act between the gear 51 and the gear 53 and constitute means for providing the functional connection of the stabilizer pinion 30 to the driving pinion 21.

[0024] The third gear 53 in fact meshes with a fourth gear 56 which is keyed to the auxiliary shaft 32.

[0025] The friction means 60 are actuated by means of an actuation stem 70 which interacts with the end 72 of a rocker 73 which has, at its other end 74, a cam follower roller 75 which interacts with a cam 76 supported by the carriage 12 and structured so as to interact by pushing on the rocker 73 when the inclination of the guide is lower than a preset value, so that in this case the friction means 60 are actuated, rigidly coupling the second and third gears 51 and 53 and accordingly rigidly rotationally coupling the main driving pinion 21 and the stabilizer pinion 30.

[0026] In the case of slopes exceeding a preset value, the cam 76 allows to disengage the friction means 60, so that the stabilizer pinion 30 rotates freely with respect to the main driving pinion 21, avoiding any forcing.

[0027] From the above description it is evident that the invention achieves the intended aim and objects, and in particular the fact is stressed that a stairlift is provided in which, when the slope exceeds a preset value, the stabilization of the assembly is ensured by gravity, which keeps the pinions 21 and 30 snugly coupled to the racks 25 and 31, and only the main driving pinion 21 is motorized.

[0028] In the portions where the slope decreases, the main driving pinion 21 and the stabilizer pinion 30 are rotationally rigidly coupled, avoiding the possibility of undesirable losses of pitch which may cause forcing,

since the stable coupling of the two pinions to the lower guide and to the upper guide occurs only in preset portions, with automatic functional uncoupling, so that it is possible to have optimum operation at all times.

5 [0029] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the inventive concept.

[0030] All the details may furthermore be replaced with other technically equivalent elements.

[0031] In practice, the materials used, as well as the contingent shapes and dimensions, may be any according to requirements.

[0032] The disclosures in Italian Patent Application No. MI99A001114 from which this application claims priority are incorporated herein by reference.

[0033] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

### Claims

- 25 1. A stairlift for variable-slope flight portions, comprising an upper guiding bar and a lower guiding bar which can be fixed to a fixed structure and have a constant distance in a vertical direction, a movable frame being slideable on said guiding bars, said frame supporting an actuation motor, a main driving pinion which is actuated by said motor and meshes with an upper toothed guide formed on said upper guiding bar and a stabilizer pinion which meshes with a lower toothed guide which is formed on said lower guiding bar, characterized in that said stabilizer pinion is freely rotatable if the inclination of said guiding bars exceeds a preset value, means for functional connection between said stabilizer pinion and said main driving pinion being also provided which are actuated if the inclination of said guiding bars is lower than said preset value.
- 30 2. The stairlift according to claim 1, characterized in that it comprises an upper carriage which has two upper rollers which engage an upper part of said upper guiding bar and is rotatably associated on an actuation shaft that supports said main driving pinion, a lower carriage being further provided which has two upper rollers and rotatably oscillates about an auxiliary supporting shaft of said stabilizer pinion.
- 35 3. The stairlift according to claim 2, characterized in that it comprises an upper roller of said upper carriage which is laterally adjacent to said main driving pinion and a roller of said lower carriage which is laterally adjacent to said stabilizer pinion.
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4. The stairlift according to claim 2, characterized in that it comprises a first gear which is keyed on said actuation shaft and meshes with a second gear which is rotatably supported by an intermediate shaft which supports a third gear which faces said second gear, said third gear meshing with a fourth gear which is keyed on said auxiliary shaft, said functional connection means acting between said second gear and said third gear.

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5. The stairlift according to claim 4, characterized in that said functional connection means comprise friction means which are interposed between said second gear and said third gear.

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6. The stairlift according to claim 5, characterized in that said friction means are operatively associated with an actuation stem which interacts with the end of a rocker which supports, at its other end, a cam follower roller which interacts with a cam which is supported by said upper carriage.

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